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# Description

# Powered Ventilator

## BACKGROUND OF INVENTION

[0001] This invention relates to a powered ventilator for a cover arrangement of a boat to circulate air and reduce the possibility of the growth of mildew and mold spores in a covered area.

[0002] When a boat is tied to a pier, moored in a bay or stored in a rack, the boat is often covered with a tarp to protect the deck from elements in the environment such as rain, dust and sunlight. While the tarp protects the deck from rain, dust and sunlight, it also prevents moisture from escaping from the area that is covered and as a consequence over a period of time the moisture and temperature may allow mold spores to germinate and grow in this type environment. In an effort to reduce the growth of mold, a ventilation system such as disclosed in U.S. Patent 6,167,658 has been suggested to keep the air from becoming stagnated. In this system, pressurized air is used to inflate a cover member for a boat deck and at the same time a

portion of the pressurized air is released through a controlled orifice to provide for continuous circulation of air through the covered area and as a result the growth of spores is attenuated as the spores are passed into the environment before they germinate and become fixed on the deck and any items thereon. This system would appear to function an a desired manner but most boat owner will opt for a more simple tarp where the sides are secured to the boat by tie downs and/or a draw string tied to the rear of the boat with a range pole located in the center of the deck to provide an apex such that rain, snow, sleet, dust and etc. would be directed off the tarp. It has been suggested to add a vent cap to the range pole or a flap in the tarp such that air may enter and exit from the deck area. With this type vent cap or flap may provide for some circulation and relieve the potential for growth of spores and mildew most of the time such circulation is very limited, as the circulation is a function of temperature and wind that is present in the surrounding environment.

## SUMMARY OF INVENTION

[0003]

[0004] It is an object of this invention to provided a cover ar-

rangement for the deck of a boat with a powered ventilator to circulate air within a covered area to attenuate the germination and growth of mold spores and mildew.

[0005] The powered ventilator has a base defined by a first disc with an axial projection that receives a pole to support and hold the cover member off the deck and a first plurality of axial openings that surround the axial projection. A first intermediary member defined by a cylindrical body has a first end with a first diameter that connected to the base and a second end with a second diameter that is separated from the first diameter by a radial wall. A first axial bore extends from the radial wall to the second end while a second plurality of axial openings surround the axial bore. The radial wall has an external groove adjacent the peripheral surface of the first diameter to receive a thickness of material of the cover member. A motor has a housing that is retained in the first axial bore to locate a fan in a chamber formed by joining the first intermediary member with the base. A second intermediary member defined by a second disc has a second axial bore for receiving the second end of the first intermediary member and a third plurality of axial openings. An end member defined by a third disc has a first face with a second an-

nular groove for receiving a solar panel and an annular axial projection a second face. A connector that is fixed to second face of the end member has a positive lead and a negative lead connected to the solar panel. A plurality of screws that extend through the end member and the second intermediate member engages the radial wall to align the second and third plurality of openings, compress the thickness of material of the cover member in the annular groove on the radial wall and bring the positive and negative leads into contact with the motor. When the photoelectric cell is exposed to light, the motor is energized and the fan rotates to continually draw air into the chamber through the first plurality of openings and discharged into the environment through the second and third plurality of openings such that environmental growth conditions of mildew and mold spores is reduced in the area of the deck under the cover member.

[0006] An advantage of the powered ventilator resides in being located at the apex of a cover member by a support pole and removing air in an area covered by the cover member as a function of light shining on the covered area.

[0007] It is further object of this invention to provide a powered ventilator for a covered area wherein electrical energy de-

rived from either a photo-electric cell, a battery or a converter that changes alternating current to direct current may operate a motor to run a fan and remove air from the covered area.

[0008] Another object of this invention is to provide a cover member with solar powered ventilator whereby air is removed from a covered area whenever a solar panel is exposed to light and as a result of a continuous flow of air the growth of mildew and mold spores in the covered area may is substantially reduced.

## BRIEF DESCRIPTION OF DRAWINGS

[0009] Figure l is a schematic illustration of a boat that is moored in a body of water and protected from the elements with a cover arrangement having a powered ventilator made according to the present invention;

[0010] Figure 2 is a sectional view of the powered ventilator of Figure 1;

[0011] Figure 3 is a top view of the powered ventilator of Figure 2;

[0012] Figure 4 is an exploded view of the powered ventilator of Figure 2.

[0013] Figure 5 is a view taken along lines 5-5 of Figure 4 showing reinforcing ribs in a top intermediate member of the

powered ventilator;

[0014] Figure 6 is a view taken along lines 6-6 of Figure 4 showing reinforcing ribs in a bottom intermediate member of the powered ventilator;

[0015] Figure 7 is a view taken along lines 7-7 of Figure 4 showing reinforcing ribs in a base of the of the powered ventilator; and

[0016] Figure 8 is a sectional view of a second embodiment of the powered ventilator having an adapter for powering a motor through a remote source of electrical energy.

## DETAILED DESCRIPTION

[0017] Figure 1 is a schematic illustration of a boat 10 that is moored in a body of water having a deck that is covered by a cover member 12 to protect it's deck for the elements. The cover member 12 is secured to the boat 10 by a plurality of tie down members 14,14'...$14^n$ and/or a draw string member 16 with a support pole 18 located along a center line of the boat to hold the cover member 12 off the deck by defining an apex 20 whereby rain, water, dust and would be directed to flow into the water without being retained in a pocket in the cover member 12. A powered ventilator 24, according to the present invention, is located in an opening 22 of the material from

which the cover material is made by the support pole 18. When the powered ventilator 24 is functioning, air from the surrounding environment is drawn into the area of the deck by flowing between the tie downs members 14,14'...$14^n$ to replace air in the covered area while air is evacuated from the covered area to provide for circulation and reduce the growth conditions necessary for mold spores and mildew to flourish.

[0018] The powered ventilator 24 is more particularity illustrated in Figure 2-7, and essentially consists of a base 30, a first intermediary member 60 that houses a fan 58 rotated by motor 51, a second intermediary member 70, and an end member 80 that are joined together by fastener means 104,104' to define a unitary structure that functions to removing air from an environment covered by the cover member 12.

[0019] The base 30, as best shown in Figures 2, 4 and 7, is defined by a disc 32 having a first plurality of axial tabs 34,34'...$34^n$ that extend from its peripheral surface 36, a first cylindrical axial projection 38 that receives the support pole 18, a plurality of axial openings 40,40'...$40^n$ and slots 41,41'...$41^n$ and a plurality of reinforcing ribs 42,42'...$42^n$ that extend from the axial projection 38 to

the peripheral surface 36.

[0020] The first intermediary member 60, as best shown in Figures 2, 4 and 6, is defined by a cylindrical body 44 with first diameter section 45 that extends from a first end 46 to a radial wall 48 and a second diameter section 43 that extends from the radial wall 48 to a second end 49. A axial bore 50 extends from the radial wall 48 through the section diameter section 43 to the second end 49 while a plurality of axial openings 52,52'...$52^n$ extend through the radial wall 48 at a location between the peripheral surface of the second diameter section 43 and a peripheral surface of the first diameter section 45. The radial wall 48 has an external annular radial groove 56 that is located adjacent the peripheral surface of the first diameter section 45 for receiving a thickness of material of a cover member 12. The peripheral surface of the first diameter section 45 is further defined by a plurality of hooks 47,47'...$47^n$ that are located adjacent end 46 while radial wall 48 has a plurality of axial tabs 54,54'...$54^n$ that are in axial alignment with the axial bore 50 and extend therefrom toward the first end 46.

[0021] The electric motor 51, as best shown in Figures 2 and 4, has a housing 53 that is located in axial bore 50 of the

first intermediary member 60 and retained therein through the engagement of axial tabs 54,54'...$54^n$ with a first end surface to hold a second end surface in contact with a grounding sleeve 55 that is located in axial bore 50. The electric motor 51 has a center anode 59 and an axial shaft 57 to which a fan blade 58 is attached.

[0022] The second intermediary member 70, as best shown in Figures 2, 4 and 5, is defined by a disc 66 with an projection 68 having an axial bore 72 that extends there through. The axial bore 72 has a diameter for receiving the second diameter section 43 of the first intermediary member 60. Disc 66 has a plurality of axial openings 74,74'...$74^n$ that extend there through and a plurality of ribs 75,75'...$75^n$ that extend from an end of the axial projection 68 to a peripheral surface 67 of the disc 66.

[0023] End member 80, as best shown in Figures 2 and 4, is defined by a disc 82 having a annular groove 84 that is located on a outer face between a center opening 86 and a peripheral edge 88 and an annular axial projection 90 on an inner face. The annular axial projection 90 has a diameter that is substantially equal to the diameter of the axial projection 68 on disc 66. Annular groove 84 receives a solar panel 92 that has a lead 94 connected to a positive

or anode 96 of connector 98. Connector 98 is fixed to inner face of disc 82 along the axial center of the axial projection 90 has a plurality of resilient strips 100,100...$100^n$ that are connected by lead 95 to a negative or cathode terminal of the photo-electric cell 92.

[0024] Fastener is defined by a plurality of screws 104,104' that extend through openings 82a,82a' of disc 82 and openings 66a,66a' of disc 66 and engage radial wall 48 to align the plurality of openings 74,74'...$74^n$ and with openings 52,52'...$52^n$ while bringing the anode 96 on connector 98 into contact with the anode 56 on motor 51 to complete an electrical circuit by way of housing 53, grounding sleeve 55 and resilient strips 100,100'...$100^n$ between the photo-electric cell 92 and motor 51 such that when the photo-electric cell 92 receives light, the motor 51 is activated to rotate fan blade 58 and draw air into chamber 61 formed by joining the first intermediary member 60 with base 30 and expel air through openings 74,74'...$74^n$ and 52,52'...$52^n$ to the surrounding environment.

## METHOD OF ASSEMBLY

[0025] The powered ventilator 24 is assembled and attached to a cover member 12 through the following steps.

[0026] An intermediary member 60 is obtained from a source.

Intermediary member 60 is defined by a cylindrical body having a first diameter 45 and a second diameter 43 that is separated by a radial wall 48. The cylindrical body has an axial bore 50 that extends there through the radial wall while the radial wall 48 has a plurality of axial passages or openings 52,52"...$52^n$. A plurality of axial tabs 54,54"...$54^n$ extend from the radial wall 48 toward a first end 46 of the cylindrical body and a plurality of hooks 47,47"...$47^n$ are located on the cylindrical body adjacent the first end 46. The cylindrical body has a under cut or slot 45a that extends from the first end 46 to a distance past face 47a on each of the plurality of hooks 47,47"...$47^n$ plus a width "w" of each tab.

[0027] A motor 51 having a housing 53 with a shaft 57 and blade 58 attached thereto is obtained from a source, the motor 51 is wired such that a anode 59 is located along the axis of shaft 57 and the housing 53 functions as a cathode for an electric circuit through which electrical current is supplied to operate the motor 51.

[0028] The motor housing 53 is inserted into the axial bore 50 of the first intermediary member 60 and end 53b brought into engagement with a grounding sleeve 55 that is already located in bore 50. The housing 53 is retained in

bore 50 through the engagement of the plurality of axial tabs 54,54"...$54^n$ with the end face 53a of housing 53 such that blade 58 is located within the first diameter 45 of the cylindrical body of the intermediary member 60;

[0029] A base 30 is obtained from a source and is defined by de-fined by a disc 32 having a first plurality of axial tabs 34,34"...$34^n$ that extend from its peripheral surface 36, a first cylindrical axial projection 38 with a bore 38a therein, a plurality of axial openings 40,40"...$40^n$ and slots 41,41"...$41^n$ and a plurality of reinforcing ribs 42,42"...$42^n$ that extend from the axial projection 38 to the peripheral surface 36. The base 30 is aligned with the intermediary member 60 and the axial tabs 34,34"...$34^n$ are located in corresponding slots 45a. Each tab of the axial tabs 34,34"...$34^n$ flexes inwardly as a force is ap-plied to push the base 30 onto intermediary member 60 and bring end 46 into engagement with face 36a on disc 36. When the axial tabs 34,34"...$34^n$ reach the bottom of slots 45a, the axial tabs 34,34"...$34^n$ snap outwardly and lock on face 47a to join the base 30 with the cylindrical body and define a chamber 61 within the intermediary member 60.

[0030] Thereafter the second end 43 of the intermediary member

60 is inserted in an opening 22 of a cover member 12, the opening being selected such that when a support pole 18 is located in bore 38a of base 30, an apex may be created for the cover member 12 that provides and holds the cover member 12 off a deck of a boat 10. The fabric of the cover member 12 is located in radial groove 56, the fabric has a greater thickness than the depth of radial groove 56.

[0031] A second intermediary member 70 is obtained from a source and defined by a disc 66 having a projection 68 with an axial bore 72 that extends there through, a plurality of axial opening 74,74"...$74^n$ that surround the axial bore 72 and a plurality of ribs 75,75"...$75^n$ that extend from end 68a of projection 68 to a peripheral surface 67 of the disc 66. Disc 66 is placed on the second end 49 of the first intermediary member 60 such that axial bore 72 is concentric with second diameter section 43 and moved toward the first intermediary member 60 to bring peripheral surface 67 on disc 66 into engagement with the fabric of the cover member 12.

[0032] An end member 80 is obtained from a source. The end member 80 is defined by a disc 82 having a photo-electrical cell 92 that is located in annular groove 84 on

an outer face and a connector 98 that is secured to an inner face. The connector 98 has an anode 96 connected to a positive lead 94 of the photo-electric cell 92 and a plurality of resilient strips 100,100"...$100^n$ connected to a negative lead 95 of the photo-electric cell 92. The disc 82 has a central opening 86 and a plurality of openings 82a,82a' each of which is reinforced by a corresponding boss 82b,82b'. The connector 98 is inserted into bore 50 of the first intermediary member 60 and screws 104,104' are passed through into opening 82a, 82a' in disc 82 and openings 66a, 66a' in disc 70. The screws 104,104' are now located in pre-drilled holes 151,151' in the radial wall 48 to align openings 74,74"...$74^n$ with openings 52,52"...52 and define a flow path from chamber 61 to the environment. The screws 104 are tightened and as a result the fabric of the material of the cover member 12 is compressed in groove 56 between the peripheral surface 67 on disc 66 and the radial wall 48.

[0033] After the screws 104,104' are torque sufficiently, a cap 20 is placed in opening 86 to form a dome and cover the electric circuit for the connector 98.The powered ventilator 24 is now part of the cover member 12 and when cover member 12 is not on a boat 10, a strip of plastic

that blocks light may be placed over the photo-electric cell 92. When the cover member 12 is placed on a boat 10, support pole 18 is placed in bore 38a of base 30 and located on the deck of the boat such that an apex is formed for the cover member 12 as tie downs 14 are attached to the boat and/or the drawn string 16 is tightened around the hull of the boat 10.

## MODE OF OPERATION OF THE INVENTION

[0034] If the photo-electric cell 92 is covered by a strip of plastic it is removed and light may be communicated to the photo-electric cell 92 to generate electrical energy the is communicated to activate motor 51 and rotate blade 58 within chamber 61. As blade 58 rotates, air is drawn into the area covered by the cover member 12 and a corresponding amount of air expelled through openings 52,52"...$52^n$ and 74,74"...$74^n$ to the surrounding environment. The motor 51 operates as long as light is communicated to solar panel 92 and thus air is continually being replaced in the covered area to attenuate and/or eliminate environmental conditions that promote the growth of mildew and mold spores.

[0035] Under some conditions such as when a boat is stored in a rack within a building rather than being moored in a body

of water, it may be desirable to provide a remotely located photo-electric cell 292 for the powered ventilator 224 of Figure 8. The powered ventilator 224 is essentially identical to powered ventilator 24 with the exception of end member 280. End member 280 is a disc 282 with that is attached to the radial wall 48 through screws 104,104 to align the openings 52,52"...$52^{n\ in}$ intermediary member 60 with openings 74,74"...$74^{n}$ in intermediary member 70 to provide a flow path between chamber 61 and the environment. Connector 298 has a cylindrical body with an anode 296 connected to positive lead 294 of the solar panel 292 and a plurality of resilient strips 200,200...$200^{n}$ connected to a negative lead 295 of the solar panel 292. The photo-electric cell 292 may be located at any spot that receives light and when it is desirous to activate motor 51, connector 298 is inserted into bore 50 to bring anode 296 into engagement with anode 56 on motor 51 and resilient strips 200,200...$200^{n}$ into engagement with grounding sleeve 55 to complete an electric circuit to active motor 51 and evacuate air from an area covered by a cover member 12. Under some circumstances, such as during long period of overcast weather it may be desirable to provide electrical current to the powered ventilator 224

of Figure 8 from a battery 292a or an inverter 292b that converts alternate current to direct current rather than a solar panel 292. In such instances, connector 298 is connected to the battery 292a or inverter 292b to operate motor 51 and remove air from a covered area to reduce the possibility of environmental conditions that enhance the growth of mildew and mold/spores.